Amendments to the Claims

This listing of claims will replace all prior versions, and listings of claims in the application.

Claim 1 (previously presented): A bandpass filter, comprising:

a plurality of spiral resonators that are electromagnetically coupled to each other, each spiral resonator having a terminal coupled to a ground;

a bypass line in parallel with said plurality of spiral resonators, said bypass line having a bypass line input coupled to a first spiral resonator of said plurality of resonators and a bypass line output coupled to a second spiral resonator of said plurality of resonators;

an input, coupled to said first spiral resonator; and

an output, coupled to said second spiral resonator;

said bypass line input formed from an outer segment of said first spiral resonator that is in-parallel and electromagnetically coupled with a first portion of said bypass line, said bypass line output formed from an outer segment of said second spiral resonator that is arranged in-parallel and electromagnetically coupled with a second portion of said bypass line, a third portion of said bypass line coupled between said first portion and said second portion, wherein said first, second, and third portions of said bypass line have a substantially constant trace width, and wherein said third portion of said bypass line is electromagnetically isolated from at least one of said plurality of spiral resonators that are between said first spiral resonator and said second spiral resonator.

Claim 2 (previously presented): The bandpass filter of claim 1, wherein said spiral resonators are quarter wavelength transmission lines.

Claim 3 (previously presented): The bandpass filter of claim 2, wherein said quarter wavelength transmission lines are microstrip transmission lines.

Claim 4 (previously presented): The bandpass filter of claim 1, further comprising:

an input capacitor coupled between said input and said first spiral resonator; and

an output capacitor coupled between said output and said second spiral resonator.

Claim 5 (original): The bandpass filter of claim 4, wherein said input capacitor and said output capacitor are printed finger capacitors.

Claim 6 (currently amended): The bandpass filter of claim [[1]] 4, further comprising:

a bypass line input coupler, coupled between said bypass line and said first spiral resonator; and

a bypass line output coupler, coupled between said bypass line and said second spiral resonator.

Claim 7 (previously presented): The bandpass filter of claim 6, wherein said plurality of spiral resonators includes a third spiral resonator coupled between said first spiral resonator and said second spiral resonator.

Claim 8 (previously presented): The bandpass filter of claim 7, further comprising:

a substrate, wherein said plurality of spiral resonators, said bypass line, said input capacitor, said output capacitor, said bypass line input coupler, and said bypass line output coupler are printed on said substrate.

Claim 9 (original): The bandpass filter of claim 1, wherein an input impedance and an output impedance are a desired value.

Claim 10 (previously presented): A bandpass filter comprising:

an input coupled to an input capacitor;

an output coupled to an output capacitor;

a first spiral resonator coupled to a ground, said input capacitor, a first intercoupler and a bypass line input coupler;

a second spiral resonator coupled to said ground, a second intercoupler, a bypass line output coupler, and said output capacitor;

a third spiral resonator coupled to said ground, said first intercoupler, and said second intercoupler, wherein said first spiral resonator, said second spiral resonator and said third spiral resonator are electromagnetically coupled quarter wavelength transmission lines;

a bypass line coupled between said bypass line input coupler and said bypass line output coupler, wherein said bypass line has a length configured to produce a signal that attenuates an image channel at said output and therefore causes improved image channel rejection at said output; and

a substrate, wherein said first spiral resonator, said second spiral resonator, said third spiral resonator, said bypass line, said input capacitor, said output capacitor, said bypass line input coupler, and said bypass line output coupler are printed on said substrate;

said bypass line input coupler formed from an outer segment of said first spiral resonator that is in-parallel with a first portion of said bypass line, said bypass line output coupler formed from an outer segment of said second spiral resonator that is arranged in-parallel with a second portion of said bypass line, a third portion of said bypass line coupled between said first portion and said second portion, wherein said first, second, and third portions of said bypass line have a substantially constant trace width.

Claim 11 (original): The bandpass filter of claim 10, wherein said input capacitor and said output capacitor are printed finger capacitors.

Claim 12 (previously presented): A differential bandpass filter, comprising:

a plurality of spiral resonators that are electromagnetically coupled to each other, each spiral resonator having a terminal coupled to a ground;

a first bypass line, in parallel with said plurality of spiral resonators, said bypass line having a bypass line input coupled to a first spiral resonator and a bypass line output coupled to a second spiral resonator;

a first input, coupled to said first spiral resonator;

a first output, coupled to said second spiral resonator;

a second plurality of spiral resonators that are electromagnetically coupled to each other, each spiral resonator having a terminal coupled to said ground;

a second bypass line, in parallel with said second plurality of spiral resonators, said second bypass line having a second bypass line input coupled to a third spiral resonator and a second bypass line output coupled to a fourth spiral resonator;

a second input, coupled to said third spiral resonator; and

a second output, coupled to said fourth spiral resonator;

said first bypass line input formed from an outer segment of said first spiral resonator that is in-parallel and electromagnetically coupled with a first portion of said first bypass line, said first bypass line output formed from an outer segment of said second spiral resonator that is arranged in-parallel and electromagnetically coupled with a second portion of said first bypass line, a third portion of said first bypass line coupled between said first portion and said second portion of said first bypass line, wherein said first, second, and third portions of said first bypass line have a substantially constant trace width, and wherein said third portion of said first bypass line is electromagnetically isolated from at least one of said plurality of spiral resonators that are between said first spiral resonator and said second spiral resonator;

said second bypass line input formed from an outer segment of said third spiral resonator that is in-parallel and electromagnetically coupled with a first portion of said second bypass line, said second bypass line output formed from an outer segment of said fourth spiral resonator that is arranged in-parallel and electromagnetically coupled with a second portion of said second bypass line, a third portion of said second bypass line coupled between said first portion and said second portion of said second bypass line, wherein said first, second, and third portions of said second bypass line have a substantially constant second trace width, and wherein said third portion of said second bypass line is

electromagnetically isolated from at least one of said plurality of spiral resonators that are between said third spiral resonator and said fourth spiral resonator; and

said first input and said second input forming a differential input capable of receiving a differential signal, said first output and said second output forming a differential output capable of producing a differential signal.

Claims 13-14 (previously cancelled)

Claim 15 (previously presented): A double conversion tuner, comprising:

a tuner input;

a first variable gain amplifier, coupled to said tuner input;

a first mixer coupled to a first local oscillator and said first variable gain amplifier;

a printed bandpass filter, coupled between said first mixer and a second mixer, including

a plurality of spiral resonators that are electromagnetically coupled to each other, each spiral resonator having a terminal coupled to a ground;

a bypass line, in parallel with said plurality of spiral resonators, said bypass line having a bypass line input coupled to a first spiral resonator and a bypass line output coupled to a second spiral resonator;

said bypass line input formed from an outer segment of said first spiral resonator that is in-parallel with a first portion of said bypass line, said bypass line output formed from an outer segment of said second spiral resonator that is arranged in-parallel with a second portion of said bypass line, a third portion of said bypass line coupled between said

first portion and said second portion of said bypass line, wherein said first, second, and third portions of said bypass line have a substantially constant trace width, and wherein said bypass line has a length configured to produce a signal that attenuates an image channel at said bypass line output;

a bandpass filter input coupled to an output of said first mixer; and

a bandpass filter output coupled to an input of said second mixer;

a second local oscillator, coupled to said second mixer;

a second IF bandpass filter coupled to said second mixer and a second variable gain amplifier; and

a tuner output, coupled to said second variable gain amplifier.

Claim 16 (original): The double conversion tuner of claim 15, wherein said printed bandpass filter is a differential bandpass filter.

Claim 17 (previously presented): The bandpass filter of claim 7, further comprising:

a first intercoupler that weakly couples said first spiral resonator to said third spiral resonator; and

a second intercoupler that weakly couples said third spiral resonator to said second spiral resonator.

Claim 18 (previously presented): The bandpass filter of claim 10, wherein said signal produced by said bypass line is out-of-phase with said image channel.

Claim 19 (currently amended): The ~~bandpass filter~~ double conversion tuner of claim 15, wherein said signal produced by said bypass line is out-of-phase with said image channel.